FINAL PERFORMANCE-BASED REMEDIAL DESIGN REPORT

SOUTHERN SOLVENTS SUPERFUND SITE
TAMPA, FLORIDA

PREPARED BY:
U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA, GEORGIA
April 2019

Contents

1.0 INTRODUCTION

The Southern Solvents Superfund Site ("the Site") is the location of a former perchloroethylene (PCE) distribution facility for local dry cleaners. PCE was stored in above ground tanks from 1977 to 1985, but leakage from the tanks, contaminating the subsurface soil and groundwater.

Since 1999, EPA has been conducting remedial actions to address the chlorinated volatile organic compounds (CVOC) in the soil and present in a separate phase known as dense non-aqueous phase liquid (DNAPL). The first remedial action attempted to address the source though the excavation of the shallow soil contamination and in-situ chemical oxidation (ISCO). The ISCO did not achieve the desired effectiveness due to heterogeneity of the subsurface soils. The oxidant was unable to fully saturate the subsurface soil and react with the CVOCs.

In 2002, the remedial action was supplemented by the installation of a soil vapor extraction (SVE) system. Similarly, the SVE system was not able to remove the DNAPL source due to heterogeneity of the subsurface.

In 2018, EPA amended the 1999 ROD, selecting an aggressive source remediation technology that has been successfully deployed at many other Superfund sites. EPA selected in-situ thermal remediation (ISTR) to recover CVOCs and other volatile organic compounds (VOCs) from the subsurface soil and groundwater in the source area underlying the Southern Solvents Site. Contaminants that have migrated into the groundwater and formed a groundwater plume in the intermediate and Floridan aquifers will be addressed though a final Record of Decision (ROD).

Several technologies, including electrical resistive heating (ERH), conductive heating, and steam, are currently available ISTR treatment technologies. ERH has been successfully deployed at two other Superfund sites in the Tampa, FL area and is assumed to be applicable to the Southern Solvents site based on the similar hydrogeological settings.

Nevertheless, EPA believes that the best result will be obtained by soliciting input and utilizing the experiences of ISTR vendors to propose the optimal ISTR treatment method. Therefore, EPA has chosen to pursue a performance-based remedial design for implementation of the ISTR remedy, rather than preparing a design-specification package for a specific ISTR treatment method.

This report will be used to procure an EPA contractor for implementation of the performance-based design.

2.0 SITE BACKGROUND

The United States Environmental Protection Agency Region IV (EPA) issued a ROD for the Southern Solvents Superfund Site, Operable Unit 1 (OU1) in September 1999. The remedy consisted of excavation and offsite disposal for the onsite vadose zone, and ISCO for the surficial aquifer. Because of the lack of effectiveness in addressing the CVOC source, EPA issued an Explanation of Significant Differences in 2002, which modified the selected remedy for the vadose zone soil, selecting SVE to treat the onsite vadose zone soil. Similarly, the SVE did not achieve the remedial action goal of source mitigation.

Therefore, in September 2018, EPA issued an Interim Amended ROD (IAROD) to include the aggressive treatment of the source area though ISTR. The selected remedy provides for the ISTR of the contaminated soil and localized groundwater. Restoration of the groundwater will be addressed though a final ROD selected for the site after the successful source remediation.

The remedial action objective (RAO) of this interim remedy is to remove 80 to 90 percent of the CVOC mass in the treatment area and to achieve a performance level of 1.0 milligram per kilogram (mg/kg) total CVOC concentration in the soil. ISTR will permanently reduce the CVOCs in the onsite subsurface soils and associated groundwater, resulting in a total CVOC mass of 1.0 mg/kg in the subsurface soil. The CVOC mass is comprised by, but is not limited to, the following CVOC contaminants: tetrachloroethylene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (DCE), vinyl chloride (VC), 1,1,2,2-tetrachlroethane (PCA), and 1,1,1-trichloroethane (TCA).

Land use and land cover surrounding the Site changed from agricultural use in 1956 to primarily commercial use in 1991. Between 1977 and 1985, Southern Solvents, Inc. stored, transferred, and distributed tetrachloroethylene (PCE) to the local dry-cleaning industry. PCE was stored in two aboveground storage tanks (ASTs) at the north end of the facility on a 25-foot by 35-foot concrete slab. Reported releases and spills of PCE from the ASTs are believed to be the cause of the soil and groundwater contamination at the Site.

The most recent data was collected by the United States Army Corp of Engineers (USACE) in October 2014 and March 2016. Additional data is available from the Focused Feasibility Study and the IAROD. Also, Remedial Design (RD) studies and plans are available from a separate Superfund site located in Tampa, Florida with similar contamination for which thermal remediation was successfully implemented. The following reports are available for review upon request:

- Interim Amended Record of Decision; Southern Solvents Inc. Superfund Site, Tampa FL; USEPA, Region 4; September 20, 2018.
- Final Focused Feasibility Study Report; Southern Solvents Superfund Site, Tampa FL; USACE; November 2017.
- Final Post ISCO Assessment Report Southern Solvents Superfund Site Tampa, FL; USACE; March 2016.
- Draft Supplemental Remedial Investigation Report Southern Solvents Superfund Site Tampa, FL; USACE; October 2014.
- Remedial Design Studies Report; Alaric Area Groundwater Site, Tampa, FL; Tetra-Tech, Inc.; October 2015.
- Construction Quality Assurance Project Plan (Preliminary (90%) Remedial Design, Basis of Design Report Revision 1), Black and Veatch Special Projects Corp.; Alaric Superfund Site, Tampa, FL; April 2012.

The technical site information provided with this design report has been provided to or developed by EPA. The information in these documents is considered accurate and complete. However, it is the responsibility of the implementing contractor, subcontractors, and consultants to confirm the validity and accuracy of all data and information, as necessary.

2.1 Site-Characteristics

The Site is located at 4009 West Linebaugh Avenue in the northwestern quadrant of Tampa, Hillsborough County, Florida (Figure 1). It is located approximately 500 feet west of the intersection of Gunn Highway and West Linebaugh Avenue. It is bordered on the east by an urgent care center and a retail automotive tire shop on the west, by a catering company to the north, and to the south by West Linebaugh Avenue (Figure 2).

The property that comprises the aboveground portion of the site is about 100 feet wide by 185 feet deep. Approximately 75 percent of the property is occupied by a metal fabricated building on a concrete slab and asphalt parking area. The property is owned by AAA Diversified Services (a commercial painting company). The only access to the property is through a single-entry point from the five-lane Linebaugh Road. With permission, an additional entry point may be gained from Gunn Highway through the catering property. A layout of the Site is shown in Figure 2.

2.2 Geologic Setting

The Tampa Bay area is underlain by a thick sequence of sedimentary rocks that can be divided into an upper zone of unconsolidated sediments and a lower zone of consolidated carbonate rock. The following geologic units are present beneath the site, in descending order: undifferentiated surficial terrace deposits, the Hawthorne Group, the Suwannee Limestone, the Ocala Limestone, and the Avon Park Formation.

At land surface, undifferentiated sediments comprising of silt, sand, and clay from the surficial deposits vary in thickness from 20 to 50 feet thick. Holocene Series terrace sands underlie the uppermost sediments. These sands are fine to very fine grained and are comprised of quartz. Underlying these sands are Pliocene Series silts and clays which form the base of the undifferentiated surficial deposits. These silts and clays were formed by shallow marine conditions and weathering of the underlying Hawthorne Group (Black and Veatch, 2007).

Underlying the undifferentiated sediments is the phosphatic clay and limestone of the Hawthorne Group which includes the uppermost Peace River Formation and lowermost Arcadia Formation (Scott, 1988). In the Tampa Bay region, the Peace River Formation is largely absent. The Arcadia Formation, which comprises most of the Hawthorne Group sediments in the area, includes the Tampa Member (formerly designated the Tampa Limestone) in the middle and lower portion.

Lithologic-wise, the uppermost portion of the Arcadia Formation (Hawthorne Group) contains mostly siliciclastic clayey materials that grade into a carbonate sequence (Scott, 1988). The middle and lower portion of the Arcadia Formation consists chiefly of limestone and dolomite containing various amounts of quartz sand, clay, and phosphate grains. Thin beds of quartz sand

and clay that are generally very calcareous or phosphatic are often scattered throughout the section (Scott, 1988).

Underlying the surficial sands and clays are a series of Tertiary limestone and dolomite units that form the carbonate platform of peninsular Florida. The sequence of carbonate rocks includes, in descending order, the following formations: Tampa Member of the Arcadia Formation, Suwannee Limestone, Ocala Limestone, and Avon Park, Oldsmar, and Cedar Keys Formations. A lithologic change from limestone and dolomite to a sequence of gypsiferous dolomite begins in the lower portion of the Avon Park Formation and continues into the Oldsmar and Cedar Keys Formations. The top of this lithologic unit is generally considered the base of the freshwater production zone of the Upper Floridan aquifer.

The Tampa Bay area is dominated by karst topography areas where the clayey sediments of the Upper Hawthorne Group are absent or very thin (Southwest Florida Water Management District [SWFWMD], 1996). This is caused by the dissolution of the limestone by infiltrating rainfall. The dissolution process can create or enlarge cavities in the carbonate rock, which over time can result in progressive integration of cavities into vertical and horizontal flow pathways. A localized

FIGURE 1
SITE VICINITY MAP
SOUTHERN SOLVENTS

collapse of one of these pathways or cavities creates a sinkhole. The site is located in an area of dense historical sinkhole activity.

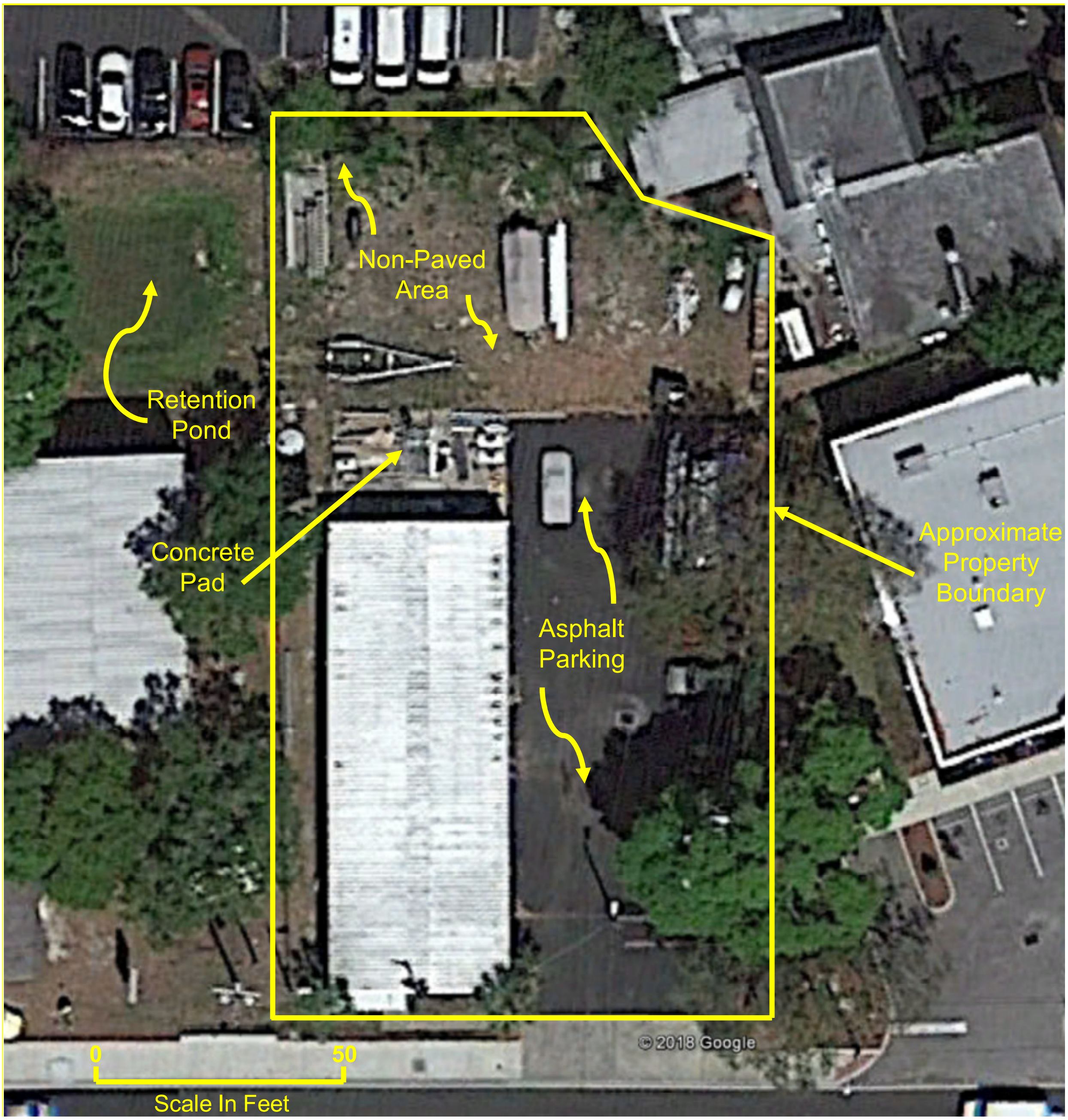

FIGURE 2
SITE FEATURES MAP
SOUTHERN SOLVENTS

Potential karst features have been investigated using ground-penetrating radar during the OU1 investigation performed in 1997. The data collected did not indicate sediments present from the infilling of sinkholes.

2.3 Site-Specific Geology

Site-specific geological information was obtained from drilling operations during monitoring well installation and other previous investigations. The soil onsite is primarily composed of very fine to medium-grained quartz sand, silty sand, and lean clay. The clay layer is from the Hawthorne formation and varies greatly in thickness across the investigation site. Limestone lies beneath the Hawthorne formation and the limestone unit appears to be highly weathered at shallow depths beneath the overlying sediment.

2.4 Hydrogeology

The three aquifers affected by this site are the unconfined surficial aquifer, the semi-confined intermediate aquifer and the Upper Floridan Aquifer. The surficial and intermediate aquifers are recharge sources for the Upper Floridan Aquifer. The primary concern for this site is the migration of the DNAPL contaminants through the surficial aquifer and the Hawthorne Formation. The Hawthorne serves as a thin and discontinuous confining layer onsite. This has allowed for contamination of the Upper Floridan Aquifer as evidenced by contamination of source wells off the property.

2.4.1 Surficial Aquifer

The surficial aquifer is comprised primarily of unconsolidated deposits of fine-grained sand, silt and clayey sands with an average thickness of 30 feet. The surficial aquifer system extends from the water table to the intermediate semi-confining unit. The surficial aquifer system ranges in thickness from 15 to 35 feet below ground surface (bgs) and is unconfined, except in localized areas where clay layers create semi-confining conditions.

Groundwater typically occurs from 2 to 6 feet bgs in the region and from 4.5 to 8.5 feet bgs at the site. The unconsolidated materials that comprise the surficial aquifer are generally low in permeability; therefore, it neither yields nor transmits significant amounts of water. Surficial groundwater flow is localized and is significantly controlled by topography and the karst geology. Groundwater in the surficial aquifer is often vertically intercepted by the Floridan aquifer before it travels horizontally and is therefore not considered to be a regional flow system.

The surficial aquifer is the principal recharge source of the Upper Floridan aquifer via downward vertical leakage across the semi-confining unit or aquitard. Recharge is primarily through surface water infiltration of precipitation; groundwater discharge occurs through seepage into area creeks, rivers, and wetlands. The surficial aquifer is used primarily for lawn irrigation and watering livestock. Typical yields are less than 20 gallons per minute (gpm). Horizontal hydraulic conductivity of the surficial aquifer varies from 3 to 40 feet per day (ft/day). Cherry et al, (1970) reported the vertical hydraulic conductivity ranges from 1.34 x 10-4 ft/day to 28.1 ft/day with an average porosity of 39 percent. Effective porosity is approximately 25 percent (Cherry and Brown, 1974).

2.4.2 Intermediate Surficial (Semi-Confining) Unit

Below the surficial aquifer is a semi-confining unit comprised chiefly of clay, silt, and sandy clay that retards the flow of water between the overlying surficial aquifer and the underlying Upper Floridan aquifer. The confining materials are a blue-green to gray, waxy, plastic, sandy clay and clay. The Hawthorne Group typically forms the semi-confining layer. The middle and lower parts of the Arcadia Formation contain the predominately carbonate Tampa Member that is typically in direct hydraulic connection with the underlying limestone units. Regionally, the thickness of the unit varies from essentially zero to more than 60 feet. Due to the highly karstic nature of the Tampa Member, the thinning or absence of the clay in some areas significantly increases the hydraulic connection between the surficial and Upper Floridan aquifers. Beneath the site, the unit ranges in thickness from 2.5 feet in monitoring well EPA-55 (onsite source well) to 28.5 feet in monitoring well EPA-38. The unit appears at about 15 to 20 ft bgs across the site. The vertical hydraulic conductivity of the semi-confining unit averages 1.22 x 10-3 ft/day (SWFWMD, 1996). The majority of the leakage occurs through fractures or karstic collapses in the confining unit, rather than through the clay itself. SWFWMD conducted over 22 aquifer pumping tests that determined an average leakage coefficient (vertical conductivity/thickness) of 2.3 x 10-4 feet per day per foot (ft/day/foot).

2.5 Conceptual Site Model

PCE was released to the surface from spillage and overflow of aboveground storage tanks/tanker trucks. The free phase PCE migrated through the sandy vadose zone where it then encountered groundwater in the surficial aquifer. Due to a relatively high density relative to water the PCE continued to migrate downward through the sandy surficial aquifer as a DNAPL. As the DNAPL migrates downward it interacts with the groundwater and partially dissolves forming a groundwater plume. During downward migration the DNAPL encountered low permeability zones such as sandy clay lenses which slowed the rate of downward migration. The DNAPL plume spread horizontally at these low permeability zones. The low permeability zones are relatively thin and discontinuous allowing the DNAPL to migrate through and around and ultimately continue downward to the Hawthorne formation which serves as an aquitard overlying the Floridan aquifer. The DNAPL has migrated in and through the Hawthorne formation and is releasing contaminant mass into the Floridan aquifer. Residual DNAPL entrained primarily in the fine-grained low permeability sediments and the vadose zone continue to release contaminant mass into the surficial and Floridan aquifers.

2.6 Nature and Extent of Contamination

The USACE and EPA conducted a soil investigation and groundwater sampling event at the Site in order to delineate the vertical and horizontal extent of PCE contamination in the subsurface. Site investigation activities were conducted in April, May (Soil), and June (Groundwater) of 2014.

2.6.1 Soil Contamination

For the soil investigation, the USACE advanced 30 soil borings to characterize the horizontal and vertical extent of the contamination and to identify DNAPL if present at the site. A total of 86 soil samples were collected and analyzed for VOCs. The soil investigation identified elevated levels of PCE throughout the area identified as the source zone during previous investigations. PCE concentrations ranged from non-detect to 23,000 mg/kg. Contaminant concentrations showed a reduction from pre-remedial action levels indicating that the SVE and ISCO were successful in reducing contaminant mass, but not in mitigating the complete source. The contamination was segregated into a shallow zone (7 to 10 feet bgs at the groundwater interface) and a deeper zone (30 to 40 feet bgs) at the top of the Hawthorne Formation confining unit). The shallow zone contamination has a limited horizontal extent, but concentrations are relatively high. This area corresponds to some of the historical hot spots where PCE was likely released. Concentrations have decreased as a result of the SVE and the ISCO remediation but continue to remain well above remedial goals. Because of the high levels of PCE, this zone will continue to leach contaminant into the surficial groundwater.

The deep zone of contamination has a larger horizontal extent than the shallow zone, but the contaminant concentrations are generally lower. The contaminants in this zone sit directly on top of and within the Hawthorne Formation. The geometry of this zone is consistent with the conceptual site model where the DNAPL was released at the surface and migrated downward through the permeable surficial aquifer. When the DNAPL encounters a low permeability zone, it spreads out and eventually permeates into and through the low permeability zone. The ISCO was less effective in this deeper zone because of the lower permeability materials and the very high contaminant concentrations. Although only a few samples were collected in the Hawthorne Formation, the recent sampling suggests that significant contaminant mass is present in and above the Hawthorne Formation. This source will continue to diffuse and leach contamination into the Floridan Aquifer. Figure 3 shows the horizontal extent of the soil contamination. Figures 4 and 5 show the cross sections through the DNAPL source zone.

2.6.2 Groundwater Contamination

For the groundwater investigation, the USEPA collected groundwater samples from 42 monitoring wells screened in the surficial aquifer. Groundwater samples were analyzed for VOCs. The results of the groundwater data indicate a significant groundwater plume that has migrated offsite, which is consistent with previous sampling. A detailed review of the groundwater monitoring data is provided in Focused Feasibility Study Report (USACE, November 2017).

3.0 SUMMARY OF SELECTED REMEDY

September 2018, EPA amended the previous interim action ROD, changing the treatment approach for the source area from ISCO to ISTR. Based on characterization of the source area from the post-ISCO injections, a source area was identified that spans an area about 4,050 square feet (ft^2),

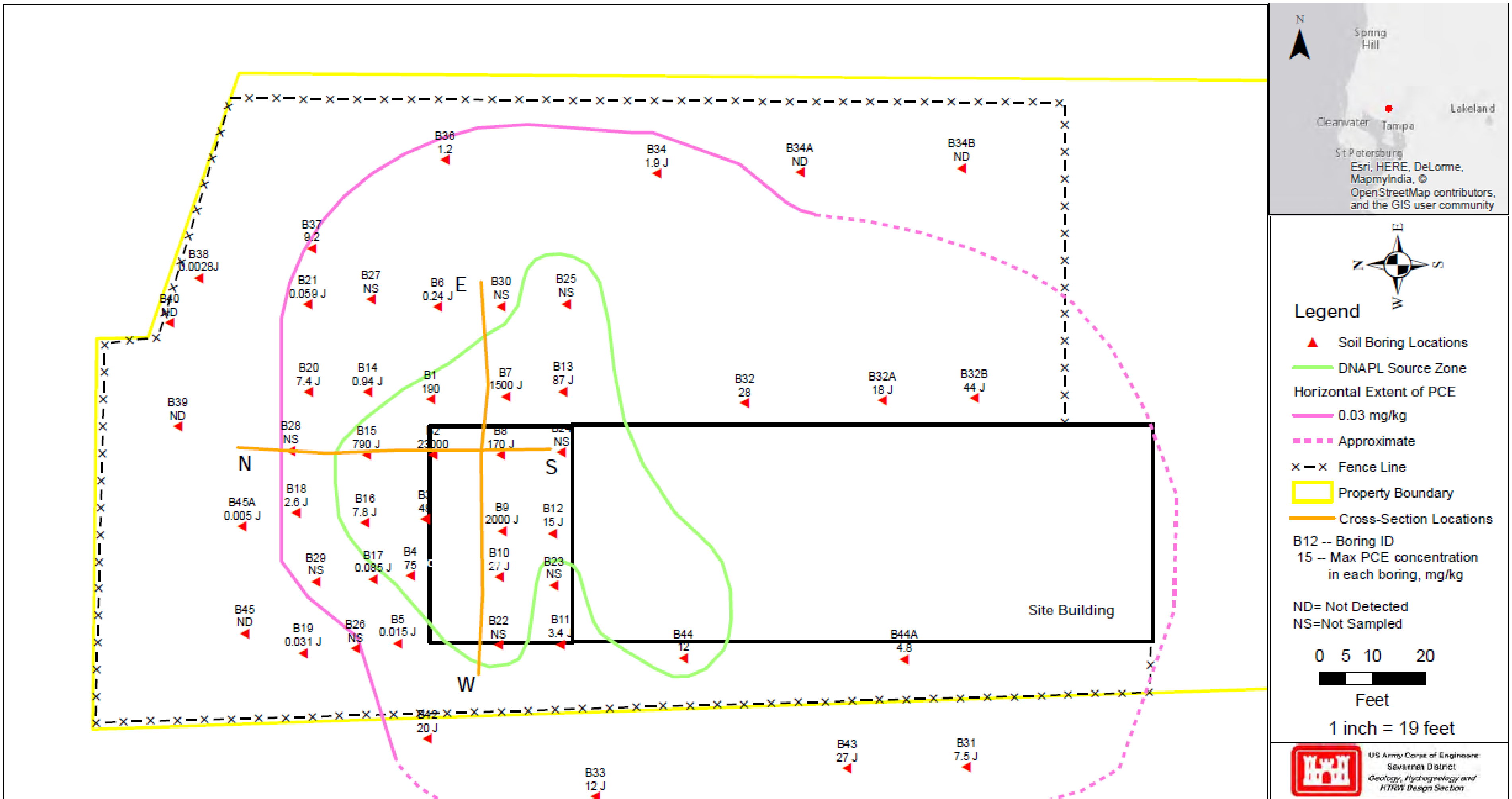

FIGURE 3
Horizontal Extent of Soil Contamination
Southern Solvents Site
Tampa, Florida

downward to a depth of about 40 feet below land surface (bls). Due to a desire not to penetrate the semi-confining clay layers of the Hawthorne Formation and create a potential migration pathway, the soil borings were terminated between 35 and 40 feet bls. To address contamination that may have penetrated into the clays of the Hawthorne Formation, the depth of the planned treatment zone was extended to 50 feet bls. This yields a total treatment zone volume of about 7,500 cubic yards (yds^3). The maximum concentration observed for PCE was 23,000 mg/kg. The remaining detections were from one to two orders of magnitude lower in concentration. A detailed review of the distribution of contamination within the source zone is available in the Post-ISCO Treatment Report (USACE, March 2016). A layout of the treatment zone is shown in Figure 4.

As noted in Section 1.0, the ISTR may be accomplished by several thermal treatment methods including ERH, conductive, and steam heating. Expertise from thermal remediation vendors will be solicited and relied upon to select the most appropriate treatment method. For the purpose of this performance-based RD, EPA will provide the performance objectives that are to be met to achieve the overall objectives of this interim source treatment action.

In order to implement the ISTR, the following activities are also required:

- Pre-treatment baseline,
- Temporary relocation of the current owner,
- Partial dismantling and reconstruction of the on-property building,
- Removal and replacement of portions of the asphalt parking area and concrete pad,
- Removal, replacement, and installation of fencing,
- Removal of existing monitoring wells, horizontal SVE wells, and other former subsurface remedy implementation and monitoring components (e.g., vaults, conduits, etc.),
- Removal and replacement of trees potentially affected by the heating,
- Restoration of property to pre-treatment conditions,
- Performance monitoring (e.g., influent/effluent water and vapor samples, air emissions, subsurface temperature, etc.),
- Performance verification, and
- Reporting.

4.0 PERFORMANCE REQUIREMENTS

The following describes the tasks and performance objectives to be completed by the prime contractor and/or in conjunction with an ISTR vendor.

4.1 Pre-Treatment Baseline

Soil data will be collected by the remediation contractor from within the source area treatment zone for the purpose of establishing a baseline for comparison to the post-

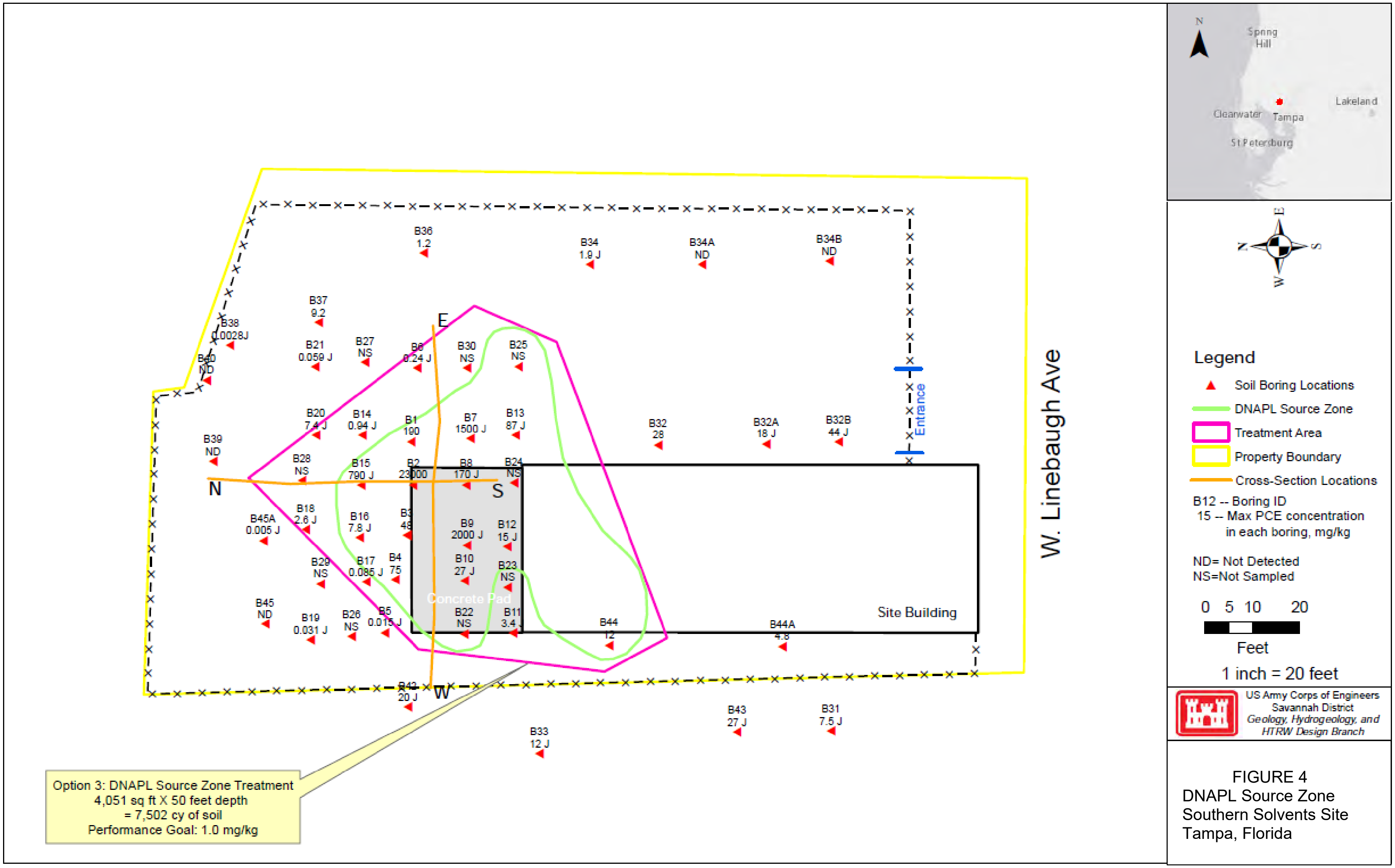

FIGURE 4
DNAPL Source Zone
Southern Solvents Site
Tampa, Florida

treatment soil concentration levels. As a minimum, soil borings will be installed at locations B2, B7, B9, and B15 which were established during the 2016 investigation (see Post-ISCO Treatment Report, USACE, March 2016), including two additional locations beneath the building (or as otherwise located by EPA). Soil cores will be collected and screened for the presence of CVOCs in the field and used to bias the collection of soil samples from each boring. As a minimum, a sample will be collected from the depth where the maximum concentration was reported during the 2016 investigation. Three additional samples will be collected from each soil boring location and sent to a fixed lab for analysis. Upon request, sample material will be provided to EPA for independent analysis.

4.2 Temporary Relocation of Owner

A single building is currently located on the property. AAA Diversified Services, Inc. owns the property and building. The building is used to support a commercial repair and painting business. According to the Hillsborough County Tax assessor's office, the building is 3,456 ft^2 in size. Also included with the property is a 5,400 ft^2 asphalt paved parking area with parking space for 12 vehicles, a 5,000 ft^2 grassy area, and a 900 ft^2 concrete pad for open air storage.

As shown in Figure 4, the treatment zone underlies the concrete pad and the northern third of the building. To access this contamination, it will likely require the installation of treatment equipment through the concrete pad and interior building floor.

Because of the need for access beneath the building, severely limited space for installation of equipment, and potential hazard to workers during the implementation of the treatment system, AAA Diversified Services, Inc. (or the current occupant at the time of remedy implementation) will be temporarily relocated. The temporary relocation shall be conducted in accordance with EPA's guidance entitled "Superfund Response Actions: Temporary Relocations Implementation Guidance, OSWER Directive 9230.0-97," dated April 2002.

Consistent with the guidance, the occupant will be provided a comparable accommodation to that located at 4009 West Linebaugh Avenue in terms of size of space, location and access, and utilities. The relocation will occur from the time of the start of construction until EPA determines that the remedy is sufficiently complete to allow for the return of the occupant. For planning purposes, the temporary relocation may take from 12 to 24 months. A more definitive time may can be estimated once the ISTR method is selected and the remedial action work plan prepared.

Because only about a third of the building may be directly impacted by the remedy implementation, it may be possible for the occupant to store equipment and supplies, provided that EPA determines it poses no hazards for implementation of the remedy. However, no one shall occupy the building during the implementation of the remedy.

The remediation contractor shall provide for the temporary relocation as described above. EPA will assist, as needed, in working with the building occupant to facilitate the temporary relocation.

4.3 Partial Dismantling/Reconstruction of Building

The northern third of the AAA Diversified Services, Inc. building overlies the treatment source zone. Depending on the type of ISTR deployed by the thermal vendor, this portion of the building may need to be dismantled to gain access.

The remediation contractor shall provide for the dismantling and repair of the building (including utilities), as necessary. The dismantling shall occur after the temporary relocation, and the repair (including utilities) completed prior to the return of the occupant. The building repair shall be conducted in accordance with applicable building codes. The repair work will be inspected by EPA to ensure that the building was restored to its original condition, prior to the start of the ISTR treatment.

4.4 Removal/Replacement/Repair of Asphalt Parking and Concrete Pad

As shown in Figure 4, the northern portion of the asphalt parking area and all of the concrete pad overlie the source area treatment zone. It is anticipated that, at a minimum, holes will be drilled through the asphalt parking and concrete slab to install equipment to conduct and monitor the ISTR.

Patching the holes in the asphalt may be satisfactory, but as noted in sections 4.6 and 4.8, portions of the asphalt may be beyond repair and require replacement. Resurfacing of the asphalt surface by adding a layer of additional material is not feasible due to the current parking and building slab being near the same elevation. If the pavement cannot be satisfactorily repaired, it will be removed and replaced to promote proper drainage away from the building.

The concrete pad has been damaged by previous remediation efforts and must be replaced. The elevation and slope of the pad must be set to promote proper drainage away from the building.

4.5 Removal, Replacement, Installation of Fencing

Fencing around the property will be a critical part of maintaining site security and protecting individuals working, living, or traveling through the area and coming in contact with hazardous conditions. The current fencing is metal chain-link, and depending on the type of ISTR, may need to be replaced with a non-conductive fencing material. Moreover, the current fencing may not be satisfactory to prevent trespassing on to the property. Higher fencing and/or privacy fencing may be necessary to provide adequate site security.

It will be the responsibility of the remediation contractor to ensure that fencing is adequate to provide reliable site-access control. After completion of the thermal remediation, AAA Diversified Services, Inc. will be consulted to determine if the new fencing can remain, or if it needs to be reconstructed to match the original fencing size and material.

4.6 Removal of Existing Wells and Former Subsurface Remedy Elements

Over the course of the former remediation and site characterization efforts, numerous wells have been installed. Also installed were vaults and horizonal conduits. In addition to the former remedial components, there are underground drainage lines that transfer stormwater runoff collected by stormwater drains in the asphalt parking lot to a stormwater detention basin on the north west side of the property.

The remediation contractor shall conduct the necessary survey of wells and other features visible from the ground surface to locate wells or other features that could either be damaged or interfere with the thermal remediation. The remediation contractor shall also conduct the appropriate subsurface remote sensing survey to locate any buried wells or other features that could be damaged or interfere with the thermal remediation. It shall be the responsibility of the remediation contractor to inventory, remove, and properly dispose of the material removed from the subsurface.

After the completion of the remediation, the drainage grates, vaults, and piping shall be replaced to promote proper drainage from the building. Up to ten groundwater monitoring wells (not to exceed 60 feet) in depth will be replaced by the remediation contractor in locations and at depths specified by EPA.

4.7 Removal/Replacement of Trees

As shown in Figure 2, two large trees are located along the eastern side of the property and two on the western side of the property. Each are outside of the thermal treatment zone and are not expected to be impacted by the treatment process.

However, during the treatment, changes in temperature or moisture content could impact the health of the trees. It is the responsibility of the thermal contractor to address any impact to the trees as a result of the treatment. This responsibility extends during the period in which water temperature in the treatment zone is elevated above the surrounding groundwater.

Remedies to impacted trees could range from trimming damaged growth to tree removal and replacement. Any work that requires alternating or removal of the trees shall be conducted in accordance with the Hillsborough County tree removal (and any other applicable) regulations.

4.8 Restoration of Property

This section primarily addresses additional restoration of the property after the completion of the treatment, removal of all treatment equipment, repair of the building, repair/replacement of the concrete pad and asphalt parking area, and trimming/replacement of trees.

Over the course of the remedial efforts since 2000, the elevation of the land surface on the north and west sides of the building has increased, significantly reducing the ability for stormwater to drain away from the building. During heavy storm events, water floods the northern portion of the building.

As part of the final site restoration, the remediation contractor shall develop and implement a stormwater management plan. As a minimum, the plan will address the proper grading of the land surface in order to promote proper drainage and stormwater management. The work shall be conducted in accordance with Hillsborough County (and other appropriate) stormwater management regulations.

4.9 Performance Monitoring

This section establishing the minimum requirements for the monitoring of the system during operation. Additional monitoring may be conducted, depending on the specific requirement of the treatment system.

During the operation of the ISTR system the following major elements will be monitored to assess the system performance, make adjustments, and estimate when the treatment goal is achieved. As a minimum, these measurements will be recorded and reported to EPA on a weekly basis.

- Treatment Zone Temperature: The matrix within the treatment zone shall be monitored aerially and with depth throughout the duration of the treatment to demonstrate that the matrix has reached, and maintains, a minimum temperature of 90 degrees Celsius for the duration of the active treatment period.

- Vapor Monitoring: Vapors recovered from the subsurface will be monitored to evaluate the effectiveness of the subsurface heating and the effectiveness of the vapor treatment system. The data will be processed to produce a CVOC vapor recovery rate graph. As the graph’s CVOC plot approaches an asymptotic point, it will be an indication that the subsurface soils may be ready to be sampled for verification that the treatment goal has been achieved.

- Ambient Air Monitoring: Air monitoring stations shall be established on the four sides of the property to monitor for the potential of off-property impacts to air quality as a result of the operation of the treatment system. Ambient air monitoring will comply with local and State air monitoring and quality requirements.

4.10 Performance Verification

Attainment of the performance goal of 1 mg/kg for total CVOCs will be demonstrated through “hot-sampling” of the subsurface soils within the treatment zone. The remediation contractor shall collect and analyze soil samples from the same boreholes and depths as was conducted for the baseline monitoring presented in Section 4.1. Upon request, samples shall be split and provided to EPA for independent analysis.

The hot sampling will generally involve the thermal remediation contractor suspending the subsurface heating and vapor recovery during the subsurface soil sample collection. Piping, wiring, and other equipment will be disconnected to provide access to the drill rig. After the samples have been collected, the treatment system will be brought back online while the samples are being analyzed and the data evaluated. Should any of the samples exceed the 1 mg/kg total CVOCs, the treatment system will continue to be operated an additional 30 days from the date that EPA notifies the remediation contractor that the performance objective was not met.

After an additional 30-day treatment period, the hot sampling will be repeated. Should it be determined by EPA that the performance objective was not achieved, EPA and the remediation contractor shall discuss and determine if an additional 30-day treatment period is appropriate or if the heating array should be augmented with additional heating.

This process of hot-sampling and data evaluation will continue until the 1 mg/kg CVOC is achieved, or at such time EPA determines that the treatment has achieved its maximum effectiveness and terminates the remediation.

4.11 Reporting

4.11.1 Project Planning

The first reporting shall include the planning documentation. This will include the preparation of a work plan, quality assurance project plan (QAPP), sampling and analysis plan, and health and safety plan by the remediation contractor. The work plan shall describe the technical approach for achieving the tasks set forth in Sections 4.1 through 4.10. The following resources shall be consulted and used, as appropriate, in the preparation of the QAPP and other planning documents.

https://www.epa.gov/quality/epa-qar-5-epa-requirements-quality-assurance-project-plans
https://www.epa.gov/quality/guidance-quality-assurance-project-plans-epa-qag-5
https://www.epa.gov/fedfac/assuring-quality-federal-cleanups
https://www.publications.usace.army.mil/portals/76/publications/engineerregulations/er_1180-1-6.pdf
https://www.epa.gov/sites/production/files/2015-06/documents/g11-final-05.pdf

4.11.2 Report and Data Submittal and Storage

All reports, daily construction notes, daily activity logs, etc., will be maintained electronically and made available to EPA upon request. This database will be made available to EPA up to a period of three (3) years after completion of the project per the contract.

4.11.3 Daily Report

Once onsite, the remediation contractor will maintain and submit daily activity logs that briefly describes the work performed each day. During installation activities, this will consist of a Daily Construction Report that documents the activities that occurred on a daily basis, materials received, and subcontractors/visitors onsite. The daily logs will be summarized and submitted with the weekly progress report.

4.11.4 Weekly and Monthly Reporting

For the duration of the project, the remediation contractor will electronically submit weekly progress reports no later than seven (7) days following end of the week. The monthly reports will focus on project schedule and budget. Project milestones and health and safety items will also be covered. During the operational phase of the project, a brief summary of the operations will be reiterated in the monthly report to be submitted no later than seven (7) days following the reporting month.

4.11.5 Operations Reporting

Throughout operations, the remediation contractor will furnish weekly status reports. Each report will be signed by the remediation contractor PM. These reports will describe the general operation of the thermal treatment system, work performed during the previous week, and anticipated upcoming work. The reports will also contain data on the following operational parameters:

- Power and energy input into the treatment volume,
- Subsurface temperatures (site average and individual monitoring point data),
- Rate and mass of CVOC recovery from the treatment volume,
- Vapor piezometer pressure data, and
- Other relevant data to assist in the calculation of air emission and contaminant mass removal rates.

4.11.6 Final Report

At the end of the project, a final report will be issued in electronic format that documents all activities, analytical, site data, schedule deviations, manifests, field logs, and any other pertinent site information.

5.0 APPENDIX A

Acronyms List

ASTs	aboveground storage tanks
bgs	below ground surface
bls	below land surface
CVOCs	chlorinated volatile organic compounds
DNAPL	dense non-aqueous phase liquid
EPA	United States Environmental Protection Agency Region IV
ERH	electrical resistive heating
ft^2	square feet
ft/day	feet per day
ft/day/foot	feet per day per foot
gpm	gallons per minute
ISCO	in-situ chemical oxidation
ISTR	in-situ thermal remediation
IAROD	Interim Amended Record of Decision
OU1	Operable Unit 1
PCE	perchloroethylene
QAPP	Quality Assurance Project Plan
ROD	Record of Decision
RAO	remedial action objective
RD	remedial design
SVE	soil vapor extraction
SWFWMD	Southwest Florida Water Management District
USACE	United States Army Corp of Engineers
VOCs	volatile organic compounds
yds^3	cubic yards